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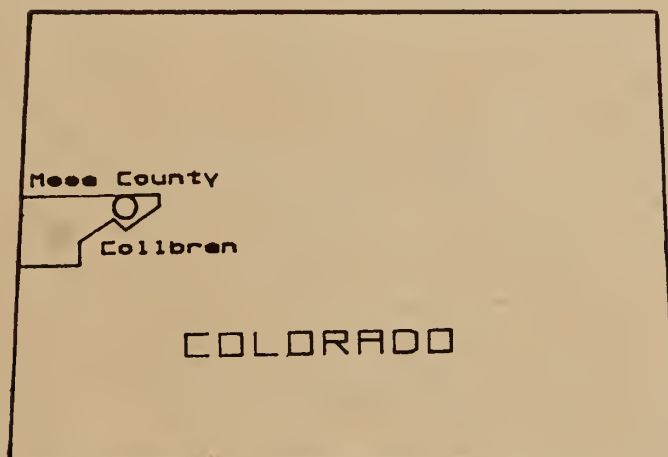
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FLOOD PLAIN MANAGEMENT  
STUDY

PLATEAU CREEK  
GROVE CREEK  
BUZZARD CREEK  
AT  
COLLBRAN, MESA COUNTY, COLORADO



24 JAN 1991

Prepared by the  
U.S. Department of Agriculture  
Soil Conservation Service  
Lakewood, Colorado  
In Cooperation with the  
Colorado Water Conservation Board  
Mesa County and the Town of Collbran

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## PREFACE

This report includes information on the flood hazard areas along Plateau Creek, Grove Creek, and Buzzard Creek in the vicinity of Collbran, Mesa County, Colorado.

Because of the potential for flood damages, detailed flood hazard studies have been recognized as an essential item in guiding the use of flood plains. The purpose of this report is to provide adequate mapping and data for implementing flood plain management programs.

Floods during the period of 1982-84 changed the channel alignment and geometry of Plateau Creek at some locations. This factor, along with the need for detailed flood plain information beyond past study limits, prompted this study.

Included in the report is information on past floods, the potential for future floods, flooded area maps, water surface profiles, selected cross sections, peak discharge data, and recommendations for reducing potential flood damages.

The Soil Conservation Service conducted the technical studies and prepared the report. These services were carried out in accordance with the Plan of Work of August, 1988.

The assistance and cooperation provided by the Colorado Water Conservation Board, Mesa County, and the Town of Collbran are appreciated and gratefully acknowledged. Much of the cross section data was field surveyed in 1989 by the County and the Town of Collbran. This field data was used in conjunction with other cross section data developed by MSM Consultants, Inc. in a 1979 study for the Federal Insurance Administration. The MSM data was subsequently used in a 1981 Flood Insurance Study for the Town of Collbran.

The hydrology used in the Flood Insurance Study was considered adequate for this current study and therefore is included herein.

The field survey, hydrologic, hydraulic, and other pertinent data and computations are on file with the U.S. Department of Agriculture, Soil Conservation Service, 655 Parfet St., Lakewood, Colorado 80215-5517, telephone (303) 236-2900. Additional copies of this report may be obtained from the Colorado Water Conservation Board or the Soil Conservation Service.

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## INTRODUCTION

This flood plain management report was prepared by the U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the Colorado Water Conservation Board, Mesa County, and the Town of Collbran, Colorado. Interpretations of the flood plain management study and recommendations to reduce damages are included; however it is beyond the scope of this report to provide detailed proposals or plans to rectify the flooding problems.

### Objectives

The objective of this study is to provide detailed flood plain management information and mapping to Mesa County and the Town of Collbran for use in implementing flood plain management programs which will minimize potential flood losses. Included in the report are engineering and hydrologic data which will facilitate the development of a flood plain management plan, road and bridge designs, and flood control measures (if needed).

### Authority

This study was requested by Mesa County and the Town of Colbran through the Colorado Water Conservation Board (CWCB). The CWCB is the coordinating agency for all flood plain information studies in Colorado and is responsible for setting priorities and scheduling these studies. The CWCB and the Soil Conservation Service entered into a Joint Coordination Agreement for flood hazard analysis in January 1972 (revised in November 1978). The Plan of Work for Plateau Creek was prepared in August 1988.

Section 37-60-106(1)(c), Colorado Revised Statutes, authorizes the Colorado Water Conservation Board "to designate and approve storm or floodwater runoff channels or basins, and to make such designations available to legislative bodies of cities and incorporated towns, to county planning commissions, and to boards of adjustment of cities, incorporated towns, and counties of this state". The board provides assistance to local governments in development and adoption of effective floodplain ordinances. In addition, the board will provide technical assistance to local entities during the performance of floodplain information studies within Colorado. Presently, direct financial assistance for the performance of floodplain studies is no longer available from the board.

Section 30-28-111 C.R.S. for county governments and Section 1-23-301 C.R.S. for municipal governments of the Colorado Revised Statutes, states the cities, incorporated towns, and counties within the study area may provide zoning regulations "...to establish, regulate, restrict, and limit such uses on or along any storm or floodwater runoff channel or basin that has been designated and approved by the Colorado Water Conservation Board, in order to lessen or avoid the hazards to persons and damage to property resulting from the accumulation of storm or floodwaters..."

Therefore, upon official approval of this report by the Colorado Water Conservation Board, the areas described as being inundated by the 100-year flood can be designated as flood hazard areas and their use regulated accordingly by the local governments.

Flood plain management studies are carried out by the Soil Conservation Service as an outgrowth of the recommendations in A Report by the Task Force on Federal Flood Control Policy, House Document No. 465 (89th Congress, August 10, 1966), especially Recommendation 9(c), Regulation of Land Use, which recommended the preparation of preliminary reports for guidance in those areas where assistance is needed before a full flood plain information report can be prepared or where a full report is not scheduled.

Authority for funding flood plain management studies is provided by Section 6 of Public Law 83-566, which authorizes the U.S. Department of Agriculture to cooperate with other federal, state and local agencies to make investigations and surveys of the watersheds and rivers and other waterways as a basis for the development of coordinated programs. In carrying out flood plain management studies, the Soil Conservation Service is being responsive to Executive Order 11988, entitled "Flood Plain Management", and Executive Order 11990, entitled "Protection of Wetlands" (both effective May 24, 1977).

## DESCRIPTION OF THE STUDY AREA

### Basin Characteristics

Plateau Creek has its headwaters in the Grand Mesa National Forest, approximately 18 miles southeast of Collbran. The stream flows northwesterly from its origin near Chalk Mountain into Vega Reservoir, approximately 11 miles upstream from Collbran. Plateau Creek then continues westerly from Vega Reservoir through Collbran to its confluence with the Colorado River approximately 19 miles downstream from Collbran. The area drained by Plateau Creek at the downstream corporate limits of Collbran is approximately 316 square miles. The drainage basin of Plateau Creek drops from an elevation of 11,000 feet at its headwaters to 6,000 feet at Collbran.

Grove Creek has its headwaters in the Grand Mesa National Forest approximately 10 miles southeast of Collbran. The stream flows northwesterly from its origin near the Sheep Flats through Collbran to its confluence with Plateau Creek just west of the downstream corporate limits of Collbran. Grove Creek has a drainage area of approximately 21.6 square miles at its confluence with Plateau Creek. The drainage basin drops in elevation from 10,400 feet at its headwaters to 5,950 feet at its mouth.

Buzzard Creek has its headwaters in the Grand Mesa National Forest approximately 21 miles southeast of Collbran. Buzzard Creek has a drainage area of approximately 180 square miles at its confluence with Plateau Creek. The drainage basin drops from an elevation of 10,000 feet at its headwaters to 5,950 feet at its confluence with Plateau Creek in Collbran.

The topography of the study area consists of gentle to moderately sloping valleys and mesas, highly dissected by drainageways with steeply sloping sides.

Soils in the Plateau Creek basin are characterized by three general zones. Zone one, which includes the upper areas of the Battlement Mesa and the Grand Mesa, consists of two general major soil groups, the Gray Wooded and Brown Podzolic Zonal great soil groups. The soils are rapidly permeable to very rapidly permeable. Winter snowfall is heavy in this area, but runoff is slow because of the pervious soil and good to excellent ground cover conditions. The dominant vegetative cover consists of pine, spruce, alpine fir, and aspen trees. Zone two, which includes the lower areas of the Battlement Mesa and the Grand Mesa, consists of two general major soil groups, the Mountain Chernozem and Chestnut Zonal great soil groups.



The ground cover ranges from good to fair, with some poor areas, and Douglas fir and Oakbrush are the dominant vegetation. The heavy snowmelt from this area runs off rapidly, causing some scattered flooding and much sediment production in the Plateau Creek basin. The valley areas are in the zone three soil group which include the Brown and Chestnut Zonal great soil groups. The dominant vegetation is pinon, juniper and sagebrush. The ground cover is poor, with some fair areas. Snowfall is light and remains only a short time. Short-duration and high-intensity summer thunderstorms are common in this area and cause heavy sediment production.

The climate at Collbran is semiarid. The mesas surrounding Collbran are subject to moderately heavy precipitation. The annual precipitation at Collbran averages approximately 13 inches, and the higher elevations of the mesas receive from 20 to 40 inches. Occurrence of precipitation is fairly uniform in the Collbran area where slightly less than one-half falls as snow from December to April. Most winter precipitation occurs in the higher elevations as snow where a deep snowpack normally accumulates. The mean annual temperature at Collbran is 46.4 degrees F.

### Study Limits

The stream reaches under study include a total of 3.1 miles of floodplain along Plateau, Buzzard, and Grove Creeks in and around the Town of Collbran. The study reaches are shown on the index map and in more detail on included flood plain maps. The Plateau Creek reach extends 2.4 miles, Grove Creek 0.5 miles, and Buzzard Creek 0.2 miles.

### Natural and Beneficial Flood Plain Values

Flood plains along Plateau Creek, Grove Creek, and Buzzard Creek, within the study limits, contain urban areas interspersed with areas of natural vegetation. The flood plain vegetation consists of a variety of forbs, grasses, sedges and rushes interspersed with cottonwoods, willows and siberian elm. The meandering channel provides an interesting diversity in landscape and vegetation. This diversity enhances the visual aesthetics and wildlife habitat values in the area.

The flood plains support a variety of wildlife species such as: cottontail, squirrel, fish, a variety of birds and many other species of wildlife. These riparian areas are very important in the arid regions of Colorado. The proximity to water and robust vegetation supported by the water regime attract more species of wildlife to this habitat type than any other.

## RELATED FLOOD STUDIES

A flood hazard boundry map for the Town of Collbran, Mesa County, was prepared in 1974 and revised in December 1975.

In 1978 Plateau Creek, Grove Creek, and Buzzard Creek were studied by approximate methods for a flood insurance study for the unincorporated areas of Mesa County.

A Flood Insurance Study was made for the Town of Collbran and published in October, 1981. The study was within the incorporated limits of Collbran including approximately 0.6 miles of Plateau Creek and 0.4 miles of Grove Creek. Detailed study methods were used in this study.

A hydrology report was made by Simons Li & Associates Inc. for the Town of Rangely, City of Rifle, and Garfield County, for Flood Insurance purposes. It has a table of peak flow-frequency data that includes Plateau Creek and Buzzard Creek. The Buzzard Creek values were used in this study since it was the best available refrence.



## FLOOD HISTORY

The most frequent cause of flooding along the study reaches is rapidly melting heavy snowpack during May, and June. Rainfall on melting snow may hasten the melting process and increase floodflows.

Summer thunderstorms are also a contributor to flooding, especially on Grove Creek. It is probable that the most extreme flood would be caused by general rain over the entire basin of Plateau, Grove, and Buzzard Creeks.

The Town of Collbran has no available records of flooding. According to information obtained from a stream gage on Plateau Creek, located approximately 6 miles east of Collbran, a flood on Plateau Creek in 1922 had an estimated discharge of 3,080 cubic feet per second (cfs). Based on the hydrologic analyses presented in the 1981 Flood Insurance Study, that flood had a frequency in excess of 100 years.

Floods during the period of 1982-84 changed the channel alignment and geometry at some locations along Plateau Creek. This was one of the factors that initiated this study.

## INVESTIGATIONS AND ANALYSIS

### Interpretation and Use of Report

#### A. Frequency and Discharge

The 10-, 50-, 100-, and 500-year flood events are used as the flood frequencies for this flood plain analysis. Thus, the data developed in this report will be suitable not only for regulation purposes, and H.B. 1041 designation but is also consistent with Federal Insurance Administration flood insurance studies conducted by the Federal Emergency Management Agency.

These various flood events have an average occurrence of once in the number of years as indicated. For example, the 100-year flood occurs, on the average, once in a 100-year period, and has a one percent chance of being equaled or exceeded in any given year.

The particular uses for the various flood events in addition to those stated above are as follows:

#### 10-year and 50-year Flood Events

Information regarding these lower frequency floods is especially useful for future engineering studies and land use planning purposes related to minor road systems, minor channel improvements, the location of parks and recreational facilities, agricultural lands, and appurtenant structures. The use of the lower frequency floods may be considered in planning flood prevention projects to protect agricultural areas, or other property where risk to life is not a factor.

#### 100-year Flood Event

The 100-year flood event may be used in lieu of lower frequencies for engineering design purposes where greater security from structure failure is desired.

However, the most important use of the 100-year flood event lies in flood plain management and land use planning as set forth in the state statutes. The State of Colorado and the Federal Government considers the 100-year frequency flood as the flood event to be used in designing and protecting structures and dwellings for human occupation. Therefore, all flood plain regulations are based upon the 100-year flood.

## 500-year Flood Event

The 500-year flood event is useful in making the public aware that floods larger than the 100-year flood can and do occur. Just because a person is living above the 100-year flood boundary does not mean that he is completely safe from flooding. The 500-year flood event can also be used for regulating high risk developments within the flood plain such as nuclear power plants, or the storage or manufacture of toxic or explosive materials.

### B. Flood Elevation

Water surface elevations for the 10-, 50-, 100-, and 500-year floods, as determined at each cross section, may be found in Table 1 "Flood Frequency-Elevation and Discharge Data". The flood profile figures (fig 3-8) show a graphical relationship of water surface elevations along the stream reaches for the given frequencies. Figures 9-11 show selected typical cross sections from different reaches within the study area.

The flood profiles may be used in areas where controversy arises over the 100-year flood boundary shown on the Flood Plain Maps. Since the flood profile exhibits give the water surface elevation at a specific point on the reference line, the flood elevations can be surveyed on the ground to alleviate any discrepancies on the base map.

### C. Flooded Areas

Flood plain maps , sheets 1 and 2, show the boundary of the 100-year flood plain. The 500-year boundary is also shown on the maps where there is a significant difference with the 100-year boundary. The flood plain boundary was plotted using flood contour elevations and stationing from the plotted flood profiles. This was done at elevation intervals compatable with the map contour intervals for that part of the study area covered by a set of 1982 Collbran Sewer District Topographic Maps. A set of 1984 Aerial Photos of the Town of Collbran was used to update channel changes not shown on the 1982 maps. Channel changes have occurred between cross sections 337 and 342, and at cross section 348 during the 2 year interval. That portion of the study area not covered by the topographic maps was plotted on the 1984 Aerial Photos directly using cross section data and interpolations between cross sections. Flood contours are shown as wiggly lines at 5 ft intervals perpendicular to the direction of flow.

## Hydrology

The hydrology for this study area involves three streams; 1) Plateau Creek, 2) Buzzard Creek, 3) Grove Creek. These are mountain streams that can flood in response to snowmelt in the spring and rainfall in the summer.

The technique for developing flood-frequency values for streams of this nature is to analyze a population of historical flood events from snowmelt and a separate population for rainfall events, and then combine the data statistically. The references used herein followed this process.

There are three main references available pertaining to the hydrology for the Collbran area; 1) Hydrology Report - Flood Insurance Studies for Unincorporated Areas of Delta and Montrose Counties, Town of Collbran, Cedaredge, Orchard City, Paonia and Naturita, Colorado, Apr. 1979, by Meurer, Serafini and Meurer Inc., 2) Flood Insurance Study - Town of Collbran, Colorado, Oct. 1981, by Federal Emergency Management Agency, 3) Hydrology Report for Town of Rangle, City of Rifle, and Garfield County Flood Insurance Studies, by Simons, Li & Associates Inc.

It was decided in meetings at the beginning of this study to use as much data from the 1981 Flood Insurance Study (Ref 2) as possible since it has already been designated and approved by the CWCB. Therefore, this study makes use of the peak discharge - frequency values which appear below;

| Stream                           | Discharge-Frequency Values |      |       |       |
|----------------------------------|----------------------------|------|-------|-------|
|                                  | 10yr                       | 50yr | 100yr | 500yr |
| Plateau Cr at<br>West Town Limit | 2880                       | 4000 | 4850  | 6900  |
| Plateau Cr at<br>East Town Limit | 1325                       | 1800 | 2100  | 2920  |
| Buzzard Cr at<br>Collbran        | 1180                       | 1940 | 2300  | 3080  |
| Grove Cr at<br>Collbran          | 415                        | 590  | 775   | 1200  |

Discharge-frequency data is not available for Buzzard Creek in the 1981 Flood Insurance Report. However, the Simons, Li & Associates, Inc. Hydrology Report (Ref 3) shows data for Buzzard Creek which is included herein.



## Hydraulics

The U.S. Army Engineers HEC-2 computer program was used to perform water surface profile computations. The program uses the standard step back water method. Cross section data from the 1981 Flood Insurance Study was used where the data was available. This study extends further upstream and further downstream than the flood insurance study, therefore, field surveys were made to supplement the available data. Dimensions for bridges were determined from field investigations for those areas not covered by the 1981 Flood Insurance Study.

Hydraulic roughness coefficients (Mannings n-values) were also determined from field investigations for those stream reaches not covered by the 1981 Flood Insurance Study. In some locations private residences with driveways and bridges along the stream were not included in the model as separate cross sections but were accounted for as extra roughness in the mannings n-value. A tabulation of roughness coefficients is included in the technical documentation and in the HEC-2 listing.

Water surface profiles, typical cross sections and maps showing the 100 year flood boundaries are shown on included exhibits and flood plain maps. Table 1 shows computed flood elevations at specific cross sections.

Flood boundaries were located on a set of March 1982 topographic maps by transferring flood elevations (at map contour intervals) from plotted profiles (from HEC-2) to the maps, using stationing along the main channel as the location reference. These points were connected and smoothed to create the map flood boundaries. This set of maps does not show recent changes in the Plateau Creek channel, therefore, a set of aerial photographs taken in July 1984, which reflect recent changes, was used to update the 1982 topographic maps.

The main channel of Plateau Creek has changed at two locations since the 1981 Flood Insurance Study was made. Their location is noted on the flood plain maps as channel changes. New bridges were built recently on Plateau Creek and on Grove Creek. These changes, along with some realignment of cross sections used in the HEC-2 Model, has made some differences in water surface elevations from the 1981 Flood Insurance Study. Data from table 1 in this report can be used to compare with data from the published flood insurance report.

## FLOOD PLAIN MANAGEMENT

Potential flood damages to existing development and possible loss of life can be alleviated or lessened through non-structural and structural flood hazard mitigation methods.

Non-structural methods include: local flood plain regulations, land treatment, flood warning and forecasting systems, flood insurance, flood proofing, flood fighting and emergency evacuations.

### Local Regulations

The need to minimize property damage due to flooding has been recognized by planners and local community officials. Subdividers and developers are required to submit proposed storm drainage plans to the planning commission for approval. In the past, drainage plans have been prepared singularly or on a plat-by-plat basis. Information contained in this report will be useful in developing a master drainage plan for the study area. This report provides the outline of flood hazard areas on large scale maps specifically for this purpose.

The city may provide zoning regulations "...to establish, regulate, restrict, and limit such uses on or along any storm or floodwater runoff channel or basin, as such storm or floodwater runoff channel or basin has designated and approved by the Colorado Water Conservation Board, in order to lessen or avoid the hazards to persons and damage to property resulting from the accumulation of storm or floodwaters..." as stated in Section 30-28-111 for county governments and Sections 31-23-302 for municipal governments of the Colorado Revised Statutes.

### Colorado Natural Hazard Area Regulations

In 1974, the Colorado General Assembly passed House Bill 1041, a bill "concerning land use, and providing for identification, designation, and administration of areas and activities of State interest,..." (H.B. 1041, Title 24, Article 65.1, CRS, as amended). Areas of State interest include natural hazard areas, or those areas that are "so adverse to past, current, or foreseeable construction or land use as to constitute a significant hazard to public health and safety or to property". Flood plains are natural hazard areas.

With reference to the administration of natural hazard areas, section 24-65.1-202(2)(a) of the Act provides: Flood plains shall be administered so as to minimize significant hazard to public health and safety or to property; open space activities shall be encouraged; structures shall be designed in terms of use and hazards; disposal sites and

systems shall be discouraged which, in time of flooding, would create significant hazards to public health and safety or to property.

The Act further provides that after promulgation of guidelines for land use in natural hazard areas..., the natural hazard areas shall be administered by local government in a manner which is consistent with the guidelines for land use in each of the natural hazard areas.

#### Colorado Water Conservation Board Designation

Concerning the designation of the flood plain, the Colorado Water Conservation Board is charged with the primary responsibility for;

1. Making recommendations to local governments and the Colorado Land Use Commission.
2. Providing technical assistance to local governments.

The Board's power and duty is...

...to devise and formulate methods, means and plans for bringing about the greater utilization of the waters of the state and prevention of flood damages therefrom, and to designate and approve storm or floodwater runoff channels or basins, and to make such designations available to legislative bodies of cities and incorporated towns, to county planning commissions, and to boards of adjustment of cities, incorporated towns, and counties of this state"..

as stated in Section 37-60-106 (1)(c) of the Colorado Revised Statutes.

Upon review and approval of this report, the Colorado Water Conservation Board will designate and approve as flood plain areas those areas inundated by the 100-year flood as described by the floodwater surface elevations and profiles in this report. The use of the designated flood plain areas may then be regulated by the local government.

#### Model Regulations

Model flood plain regulations have been promulgated by the Colorado Water Conservation Board, with the purpose to promote public health, safety, and general welfare, and minimize flood hazards and losses. The model includes provisions designed to:

1. Promote sound planning and permit only such uses within flood plains that will not endanger life, health, and public safety or property in times of flooding.

2. Protect the public from avoidable financial expenditures for flood control projects, flood relief measures, and the repair and restoration of damaged public facilities.
3. Prevent avoidable interruption of business and commerce.
4. Minimize victimization of unwary home and land purchases.
5. Facilitate the administration of flood hazard areas by establishing requirements that must be met before use or development is permitted.

The Board's model flood plain regulations offer two options for management of the 100-year flood plain. These are the Hazard Area Concept and the Floodway Concept.

The Hazard Area concept defines the areas of the flood plain in which waters of the 100-year flood attain a maximum depth greater than one and one-half feet as a high hazard area, and a depth less than this as a low hazard area.

The Floodway concept defines the channel of a stream and adjacent flood plain areas that must be kept free of development in order to safely pass the 100-year flood with a minimal rise in the water surface elevation. The rise must be no more than one foot to meet federal standards.

### Flood Insurance

The National Flood Insurance Act of 1968 (Title XIII of the Housing and Urban development Act, P.L. 90-448) recognized the necessity for flood plain management. This Act makes federally subsidized insurance available to citizens in communities that adopt regulations controlling future developments of their flood plain. With respect to encroachment on the flood plain, the regulations require:

1. New residential construction or substantial improvement of existing homes must have the lowest floor level at or above the elevation of the 100-year flood.
2. Non-residential construction must meet the same standard or be flood proofed to that level.

The 1968 Act benefits owners of structures already in the flood-prone areas by providing insurance coverage that had been unavailable through private companies. The Act created a cooperative program of insurance against flood damage by the private flood insurance industry and the federal government.

The amount of coverage available and the premium rate varies considerably depending on property location within the flood plain and the property value. All property owners shown in



this study to be within areas subject to flooding should consider the purchase of flood insurance.

Additional information on the Flood Insurance Program is available from local insurance agents or brokers and the:

Federal Emergency Management Agency, Region VIII  
Natural and Technological Hazard Division  
Building 710  
Denver Federal Center  
Denver, Co 80225  
Telephone 235-4830

The National Flood Insurance Program used the floodway concept in it's rate studies for communities participating in the regular phase of the program.

#### Flood Warning and Flood Forecasting Systems

The National Oceanic and Atmospheric Administration (NOAA) through it's National Weather Service (NWS), maintains year-round surveillance of weather and flood conditions. Daily weather forecasts are issued through the NWS and disseminated by radio and television stations. A general alert to the danger of flash flooding is one of the services provided by the NWS.

The office of the Colorado State Engineer, Division of Water Resources, in cooperation with the National Weather Service, operates a statewide flood warning system utilizing 78 stream gaging stations that are part of the Colorado satellite-linked water resources monitoring network operated by the State Engineer.

#### Evacuation Plan

An "Emergency Evacuation and Operations Plan" would provide for alerting the public of potential flooding, and coordinating community and county services during an emergency. Plan implementation during the time of an emergency requires cooperation of the general public as well as local officials. This is especially important for flood fighting, evacuation, and rescue operations. Communication is extremely important during flood alerts. Warnings issued through the NWS are disseminated by radio to state and local officials.

## RECOMMENDATIONS

The following recommendations are included for consideration in reducing potential flood damages:

1. Local units of government should update their flood plain management or flood hazard mitigation plan and incorporate the findings of this study.
2. Existing restrictions that contribute to overbank flooding should be corrected where possible and when possible.
3. Detailed studies of specific alternative measures such as floodways or dikes should be considered. The dike along the south bank of Plateau Creek near Main Street should be strengthened and maintained. A new dike along the north bank of Plateau Creek from cross section 349 upstream about 250 feet would provide flood protection to one additional residential site.
4. Owners and occupants of buildings and other property within or adjacent to the delineated flood boundry should consider flood insurance.
5. Information and education programs on flood hazards should be made available to the public.
6. The main channels should be maintained to preserve a balance between native vegetation, conveyance capacity, channel stability, and provide wildlife habitat.

## GLOSSARY OF TERMS

- Channel - A natural or artificial water course of perceptible extent with definite banks to confine and conduct continuously or periodically flowing water. Channel flow is that water which is flowing within the limits of the defined channel.
- Flood - Water from a river, stream, water course, lake or other body of standing water, that temporarily overflows the boundaries within which it is ordinarily confined.
- Flood Crest - The maximum stage or elevation reached by the waters of a flood at a given location.
- Flood Frequency - A means of expressing the probability of flood occurrences as determined from statistical analysis of representative streamflow or rainfall and runoff records. The frequency of a particular stage or discharge is usually expressed as occurring once in a specified number of years. The 10-, 50-, 100-, and 500-year frequency floods have an average frequency of occurrence in the order of once in the number of years indicated.
- Flood Hazard Areas - Areas susceptible to flood damage.
- Flood Peak - The highest stage or discharge attained during a flood event; also referred to as peak stage or peak discharge.
- Flood Plain - The relatively flat or lowland area adjoining a river, stream, watercourse, lake, or other body of water which has been or may be covered temporarily by flood water. For administrative purposes the flood plain may be defined as the area that would be inundated by the 100-year flood.
- Left or Right Stream Bank - The left or right bank of the stream looking downstream.
- Perched Channel Flow - A condition where the flow elevation in the outer portions of the flood plain is higher than the flow elevation in the main channel. This condition occurs when a secondary channel receives inflow from some location upstream and maintains a flatter slope than the main channel.
- Reach - A hydraulic engineering term used to describe longitudinal segments of a stream or river.
- Runoff - That part of precipitation, as well as any other flow contributions, which appears in surface streams of either perennial or intermittent form.
- Stream - Any natural channel or depression through which water flows whether continuously, or intermittently, including modification of the natural channel or depression.
- Structure - Anything constructed or erected, the use of which requires a more or less permanent location on or in the ground. Includes but is not limited to bridges, buildings, canals, dams, ditches, diversions, irrigation

systems, pumps, pipelines, railroads, roads, sewage disposal systems, underground conduits, water supply systems and wells.

Valley Cross Section - A plotting of the topography of a stream channel and adjoining landscape as viewed perpendicular to the flow in a downstream direction. The plotting represents a specified location within a designated stream reach.

Water Surface Profile - (This term is synonymous with Flood Profile) - a graph showing the longitudinal relationship of the water surface elevation of a flood event to location along a stream or river.

Watershed - A drainage basin or area which contributes to runoff and transmits it usually by means of streams and tributaries to the outlet of the basin.

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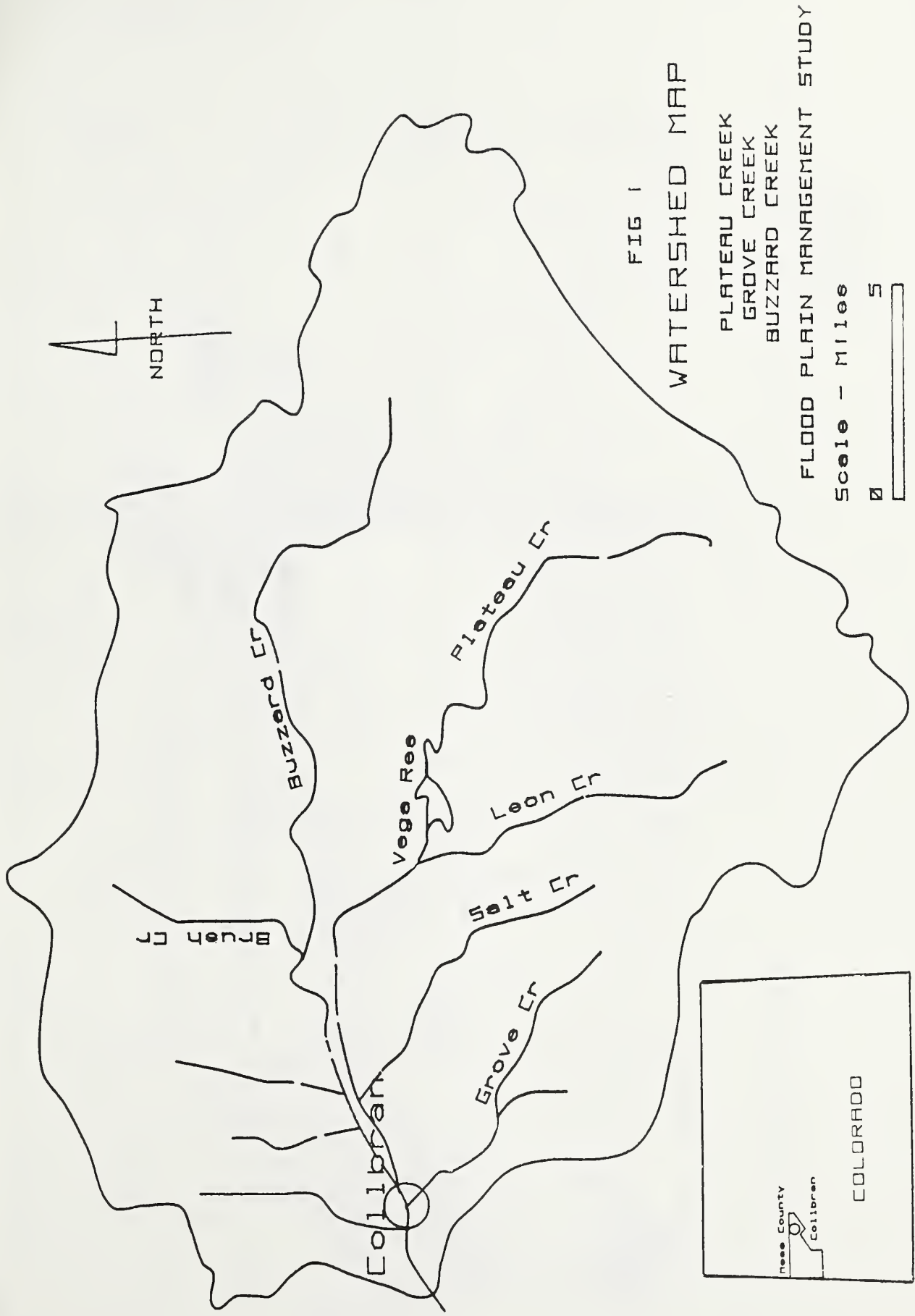


FIG 1  
WATERSHED MAP

PLATEAU CREEK  
GROVE CREEK  
BUZZARD CREEK

FLOOD PLAIN MANAGEMENT STUDY  
Scale - Miles  
0 5





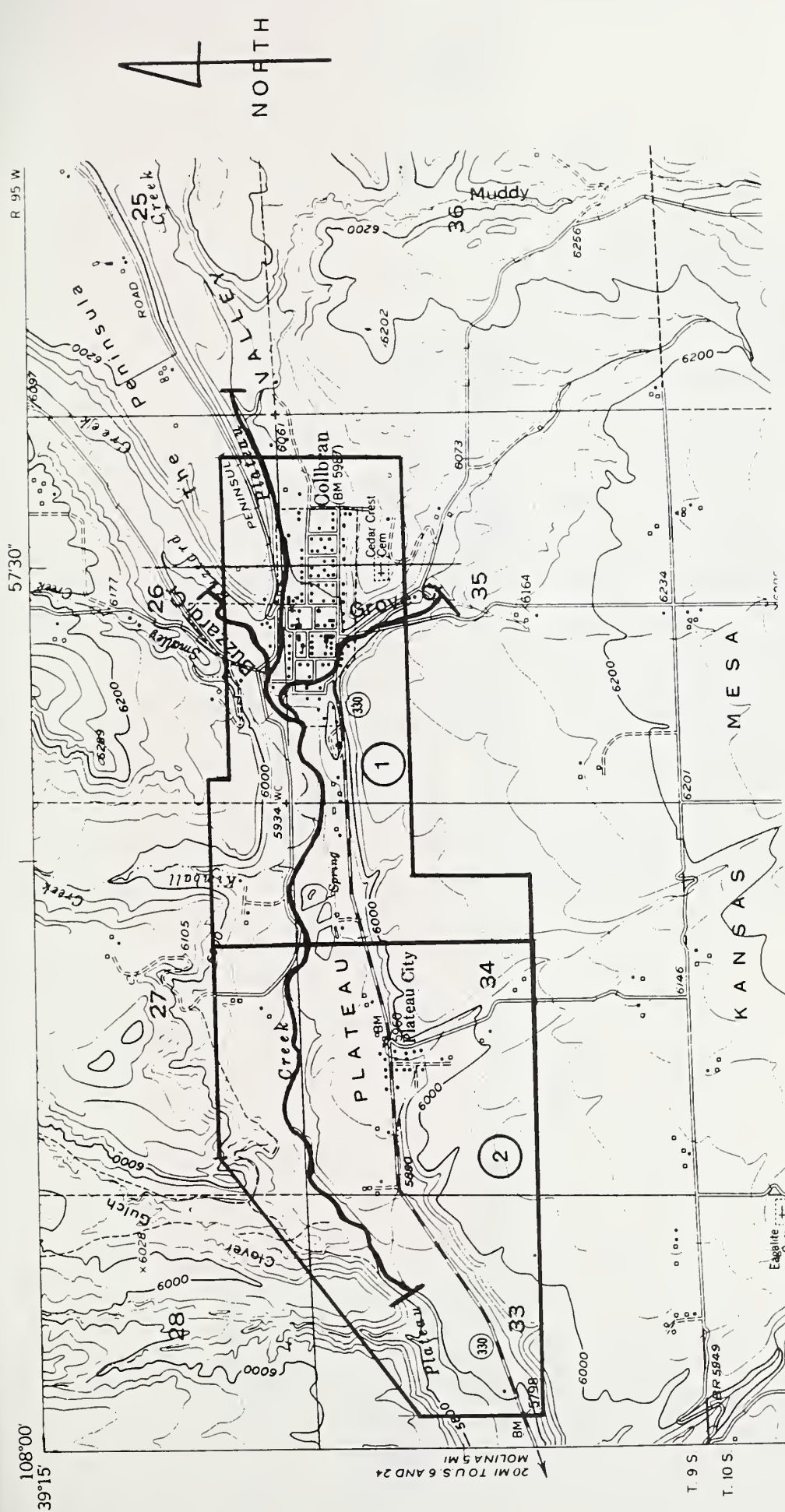


FIG 2 MAP SHEET INDEX

PLATEAU CREEK  
GROVE CREEK  
BUZZARD CREEK

1 Map sheet Number

FLOOD PLAIN MANAGEMENT STUDY













SCALE 1"=200'  
9' CONTOUR INTERVALS  
DATE OF PHOTOGRAPH 3/24/82

#### LEGEND

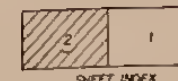
- 500 YEAR BOUNDARY
- 100 YEAR BOUNDARY
- 5880
- 100 YEAR FLOOD ELEV



STREAM CENTERLINE AND STATION IN  
100 FT FROM LOWER STUDY LIMIT



CROSS SECTION



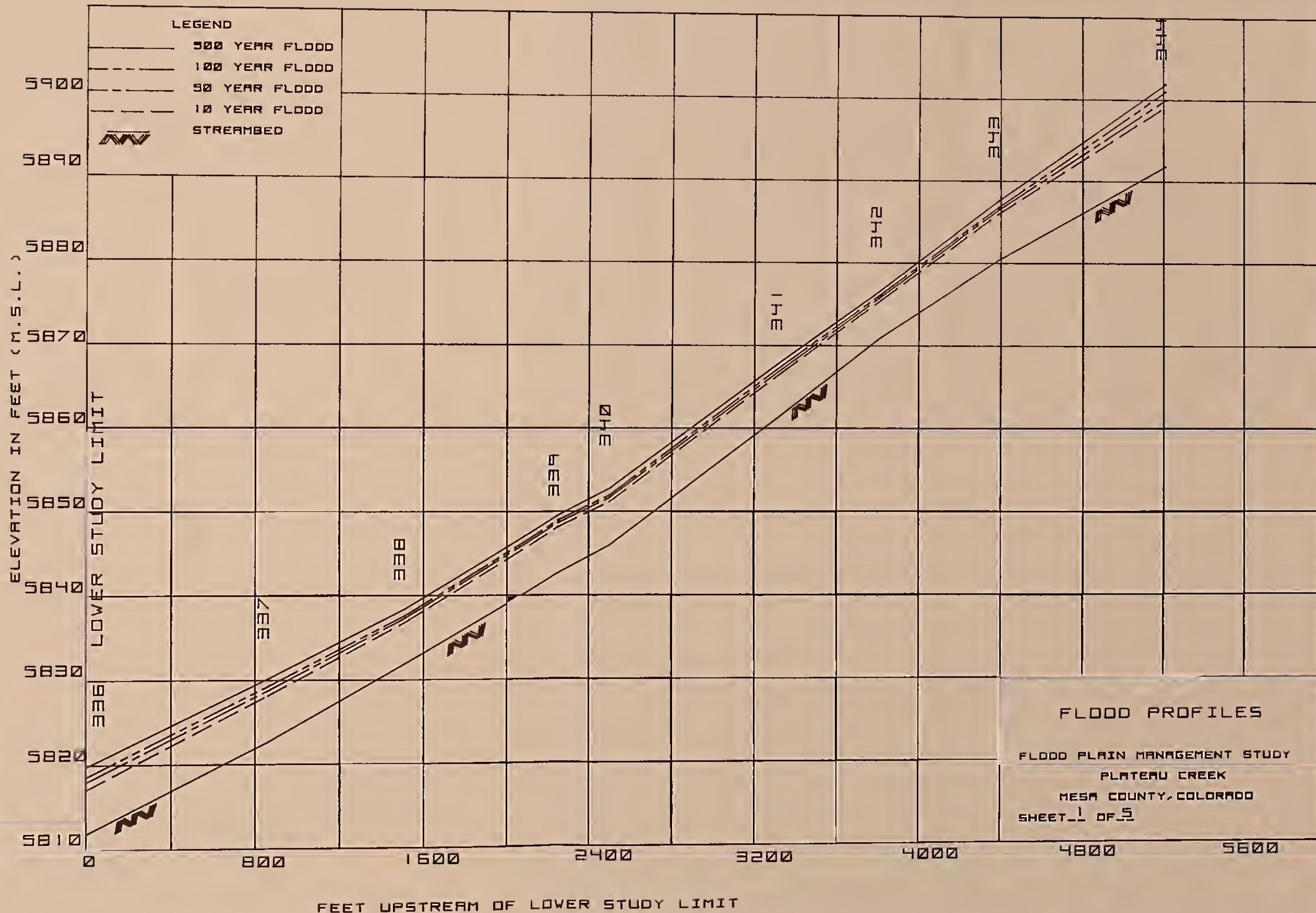
SHEET INDEX

FLOOD PLAINS  
FLOOD PLAIN MANAGEMENT STUDY  
PLATEAU CREEK - GROVE CREEK - BUZZARD CREEK

SHEET 2 OF 2

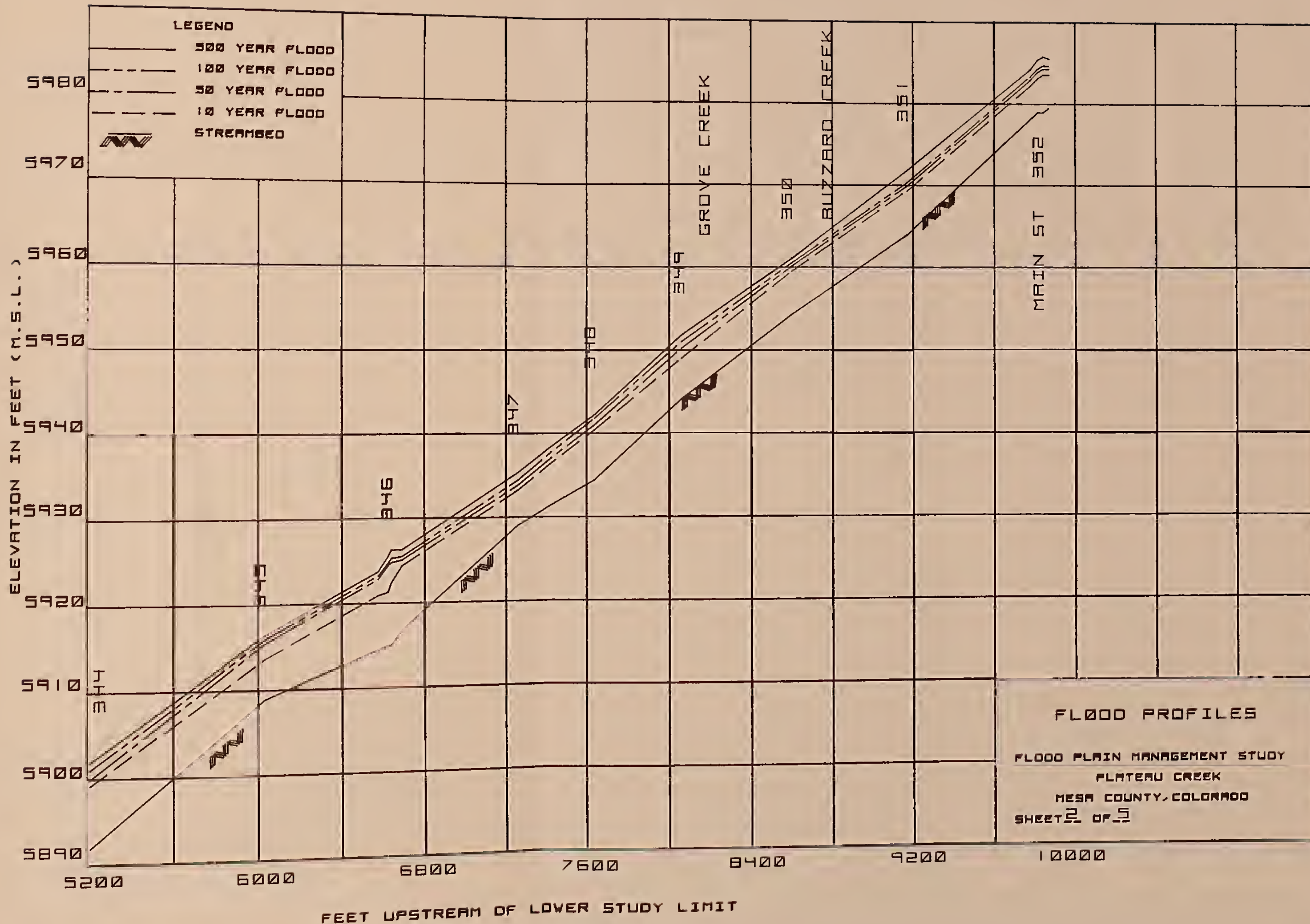




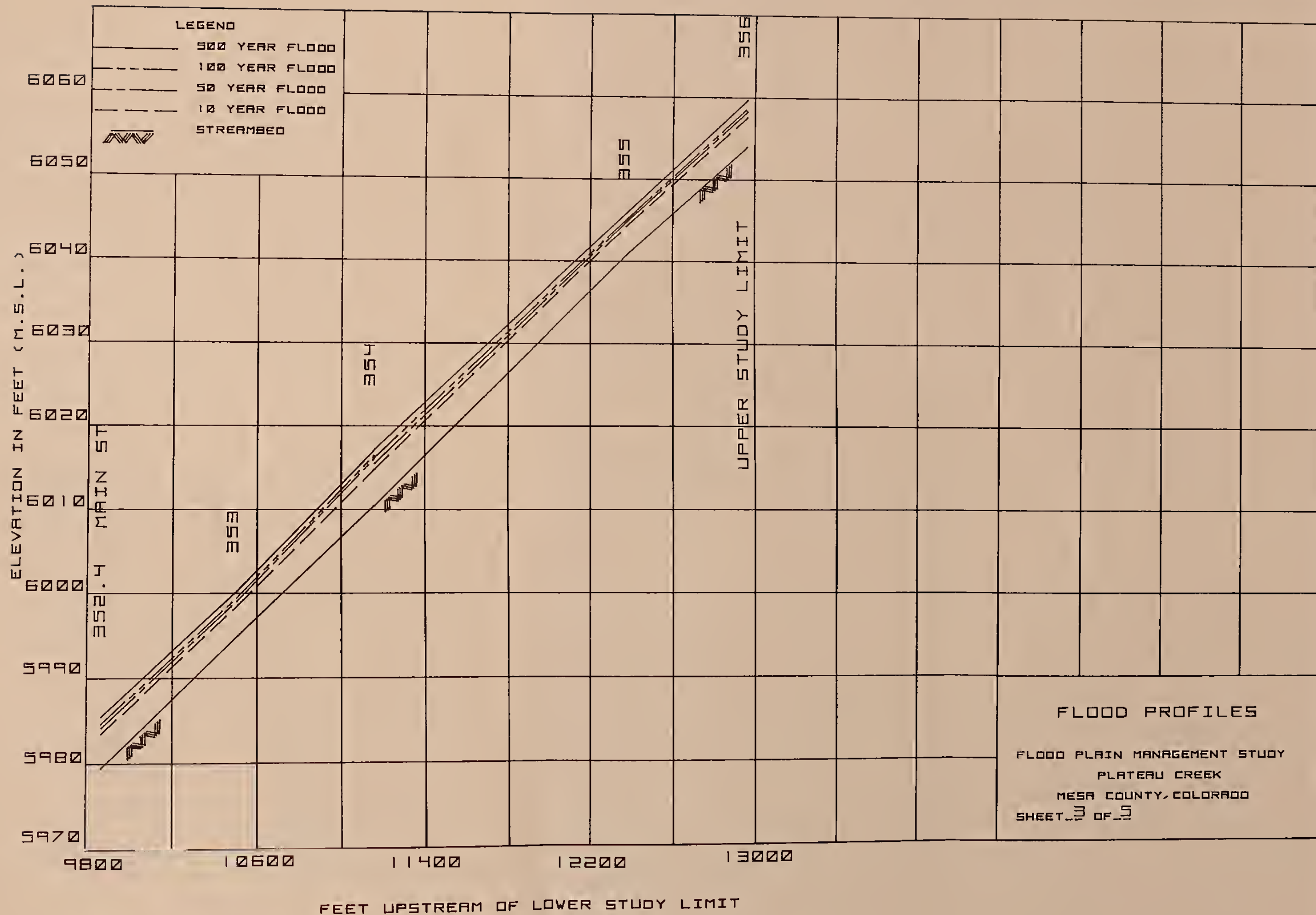






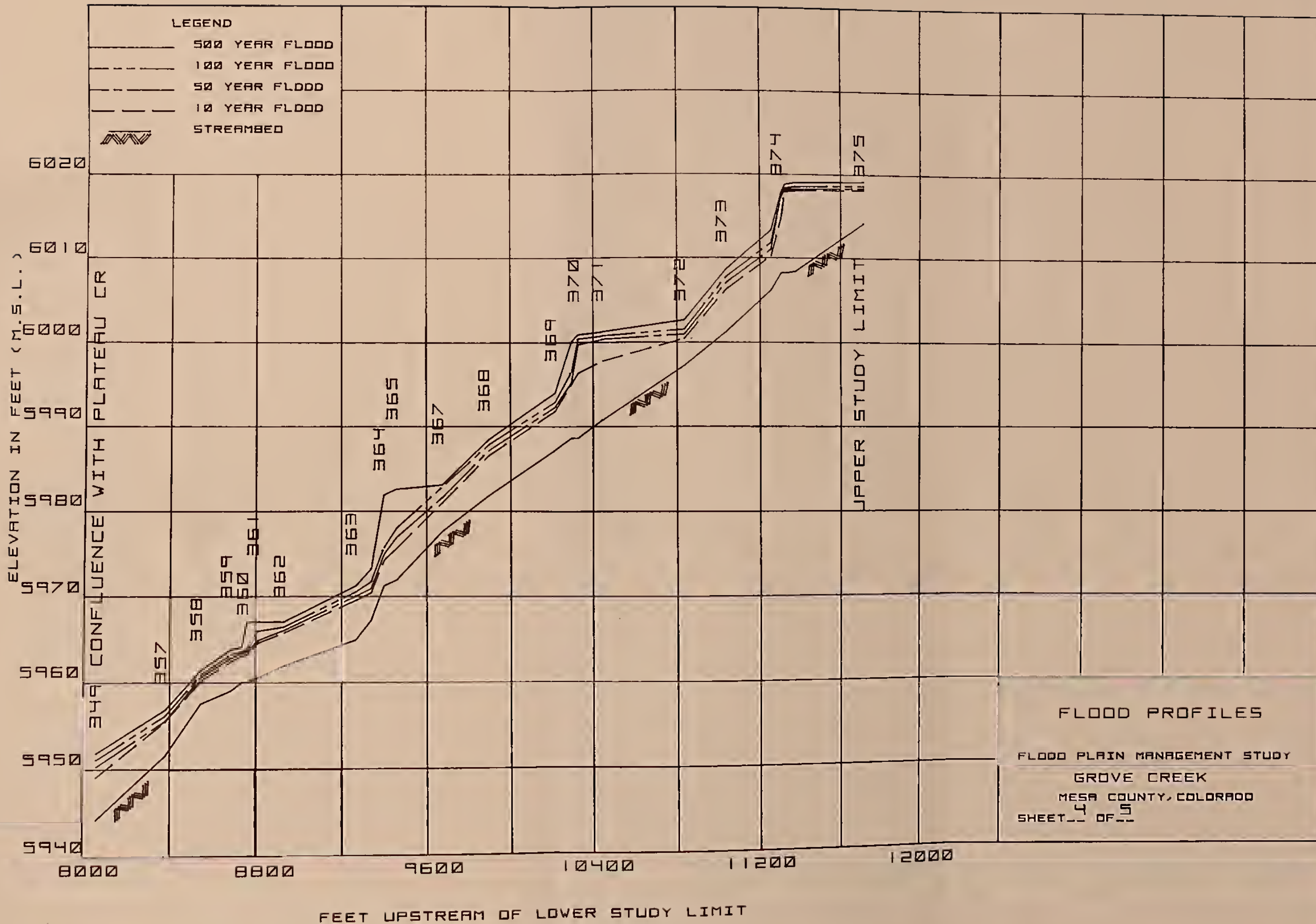






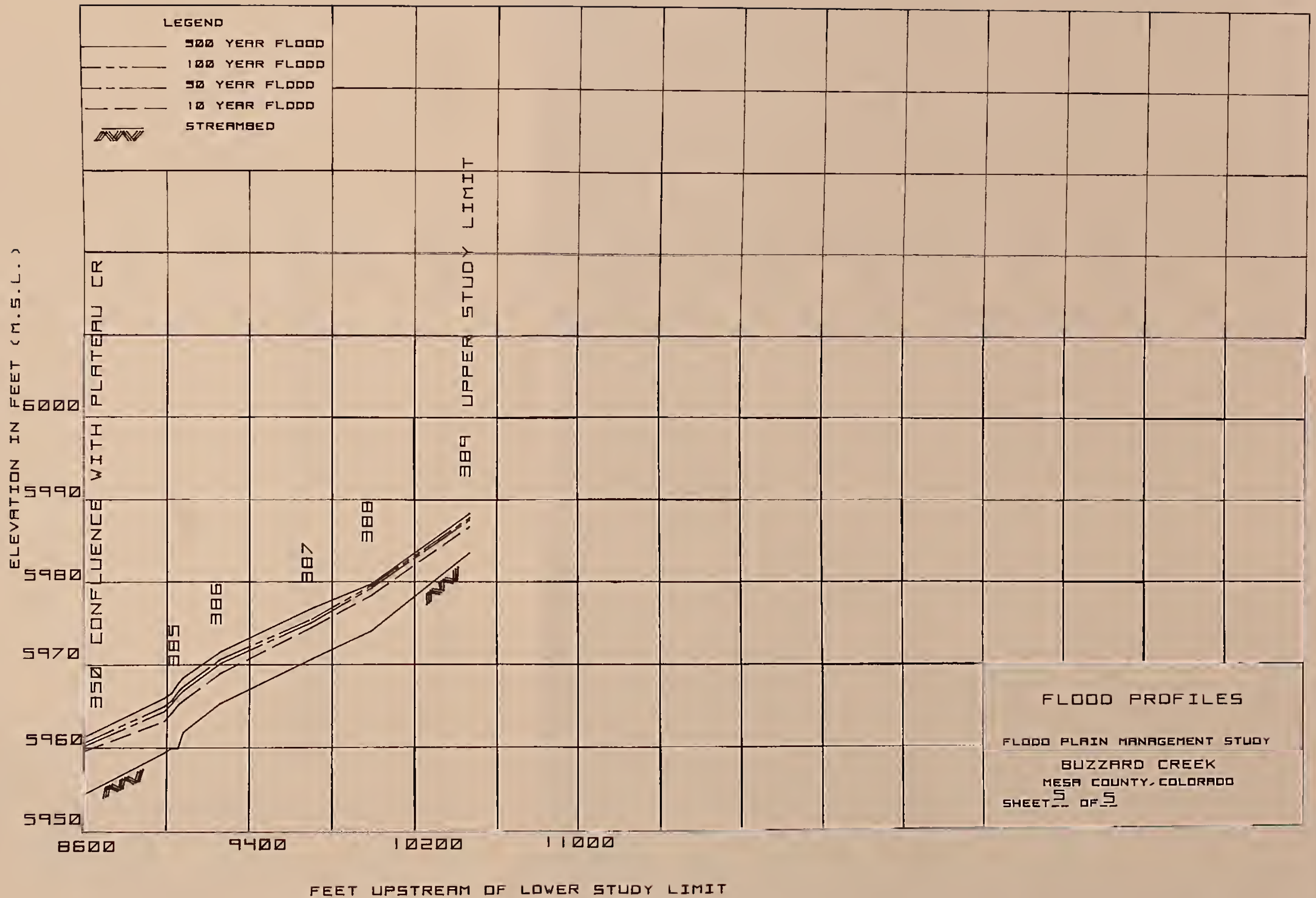






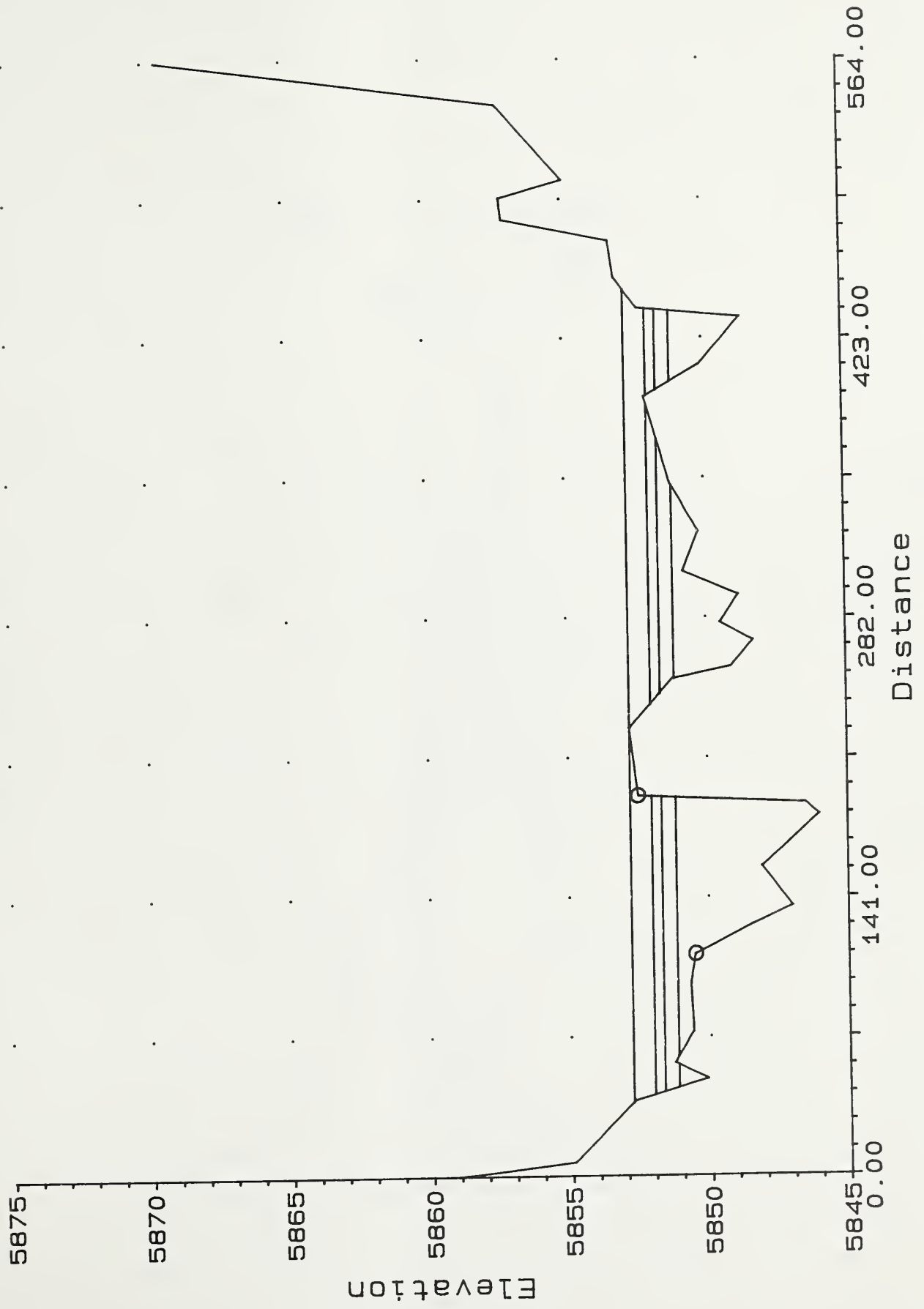








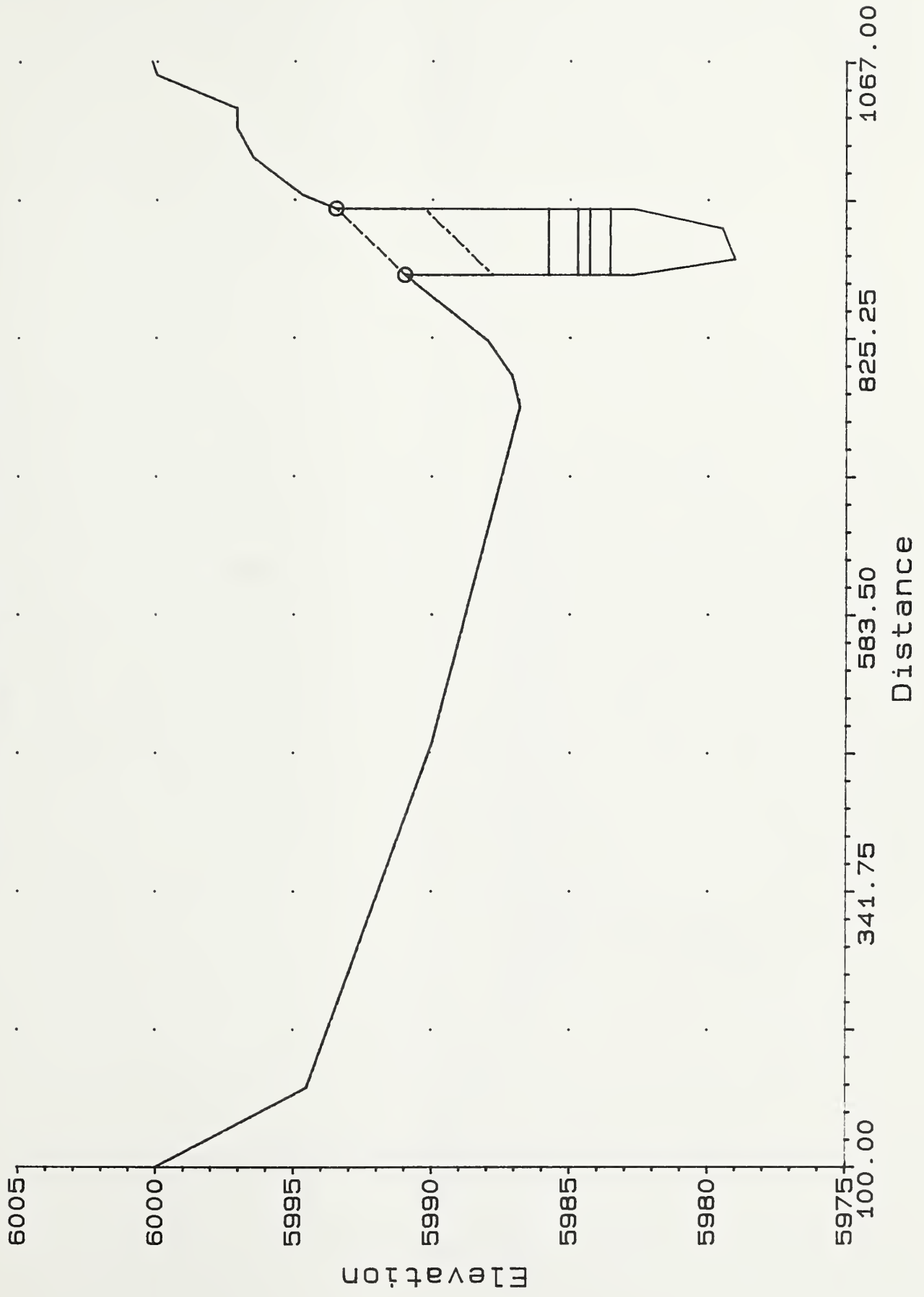
PLATEAU CREEK  
Cross-section 340.000







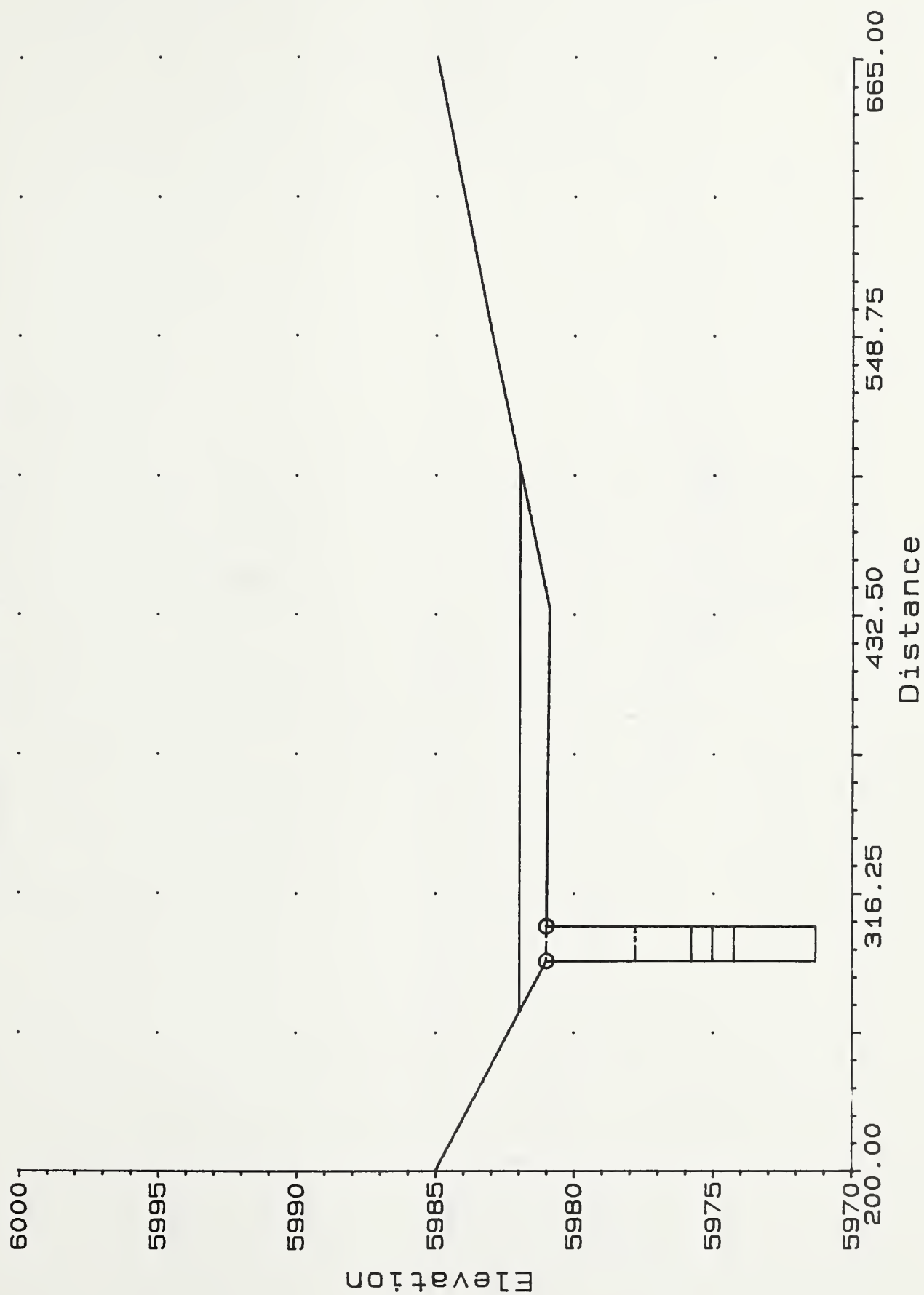
PLATEAU CREEK  
Cross-section 352.300





# GROVE CREEK

Cross-section 364.200





BUZZARD CREEK  
Cross-section 386.000

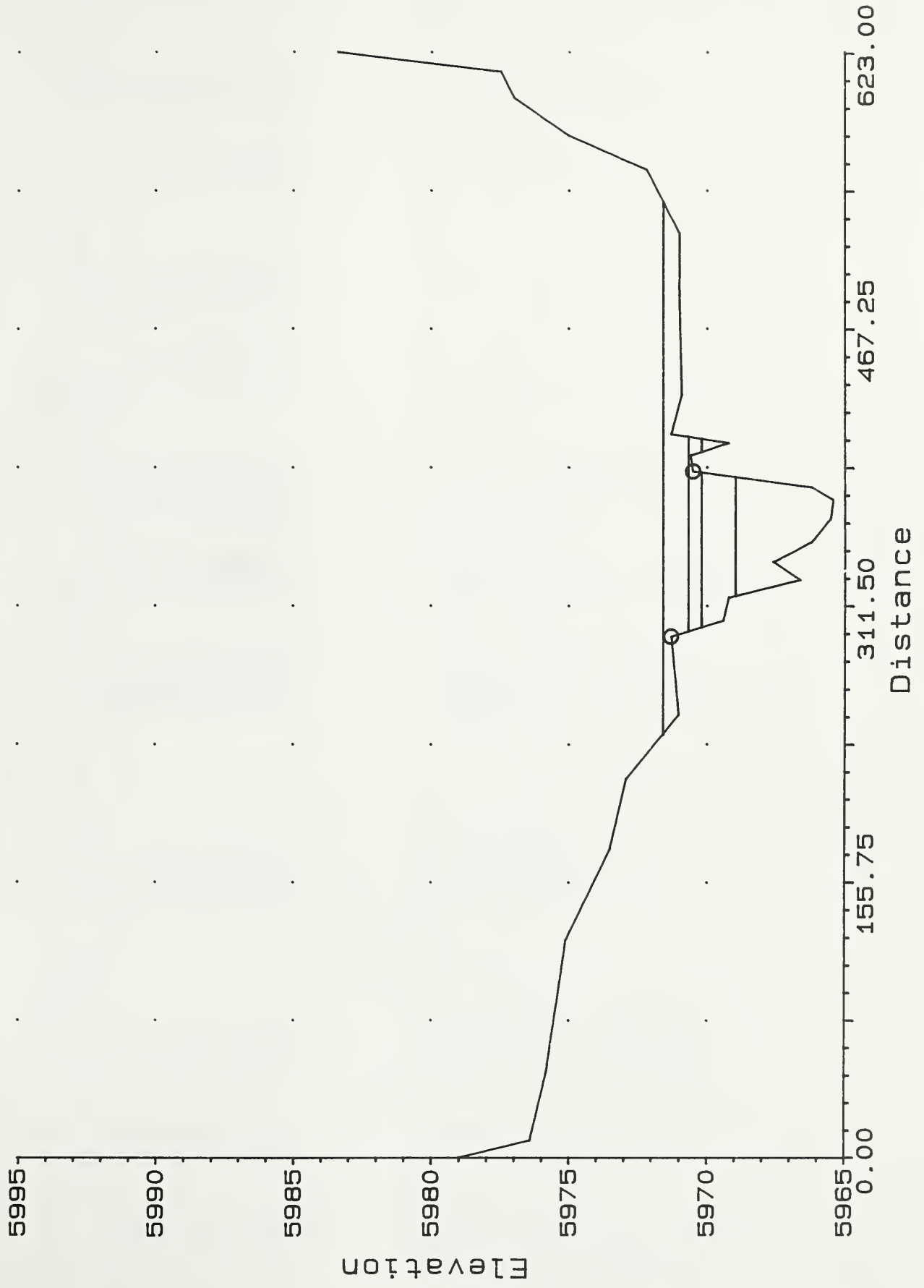






TABLE 1 FLOOD FREQUENCY - ELEVATION AND DISCHARGE DATA  
PROJECT: PLATEAU CREEK

DATE: 1/90

| X-SEC<br>ID | REACH L | X-SEC STATION | STREAM BTM | 10-YEAR FREQ |        | 50-YEAR FREQ |        | 100-YEAR FREQ |        | 500-YEAR FREQ |        |
|-------------|---------|---------------|------------|--------------|--------|--------------|--------|---------------|--------|---------------|--------|
|             |         |               |            | FT           | ELEV   | FT           | ELEV   | FT            | ELEV   | FT            | ELEV   |
| 336         | 0       | 0             | 5811.9     |              | 5817.1 | 2880         | 5818.0 | 4000          | 5818.6 | 4850          | 5819.8 |
| 337         | 860     | 860           | 5822.7     |              | 5828.2 | 2880         | 5828.8 | 4000          | 5829.3 | 4850          | 5830.2 |
| 338         | 650     | 1510          | 5831.9     |              | 5836.8 | 2880         | 5837.3 | 4000          | 5837.6 | 4850          | 5838.4 |
| 339         | 740     | 2250          | 5842.7     |              | 5848.2 | 2880         | 5848.7 | 4000          | 5849.0 | 4850          | 5849.6 |
| 340         | 250     | 2500          | 5846.0     |              | 5851.2 | 2880         | 5851.7 | 4000          | 5852.0 | 4850          | 5852.8 |
| 341         | 830     | 3330          | 5861.6     |              | 5866.7 | 2880         | 5867.1 | 4000          | 5867.5 | 4850          | 5868.1 |
| 342         | 480     | 3810          | 5871.0     |              | 5875.5 | 2880         | 5875.9 | 4000          | 5876.2 | 4850          | 5876.7 |
| 343         | 580     | 4390          | 5880.4     |              | 5886.0 | 2880         | 5886.5 | 4000          | 5886.8 | 4850          | 5887.6 |
| 344         | 820     | 5210          | 5891.9     |              | 5899.2 | 2880         | 5900.0 | 4000          | 5901.0 | 4850          | 5901.9 |

TABLE 1 FLOOD FREQUENCY - ELEVATION AND DISCHARGE DATA  
PROJECT: PLATEAU CREEK

DATE: 1/90

| X-SEC<br>ID | REACH L | X-SEC STATION | STREAM BTM<br>ELEV | 10-YEAR FREQ |        | 50-YEAR FREQ |        | 100-YEAR FREQ |        | 500-YEAR FREQ |        |
|-------------|---------|---------------|--------------------|--------------|--------|--------------|--------|---------------|--------|---------------|--------|
|             |         |               |                    | FT           | ELEV   | CFS          | ELEV   | CFS           | ELEV   | CFS           | ELEV   |
| 344         | 0       | 5210          | 5891.9             |              | 5899.2 | 2880         | 5900.0 | 4000          | 5901.0 | 4850          | 5901.9 |
| 345         | 820     | 6030          | 5909.0             |              | 5913.7 | 2880         | 5915.5 | 4000          | 5916.0 | 4850          | 5916.5 |
| 346.1       | 545     | 6575          | 5914.6             |              | 5921.0 | 2880         | 5922.9 | 4000          | 5923.3 | 4850          | 5923.8 |
| 346.2       | 50      | 6625          | 5915.1             |              | 5921.4 | 2880         | 5924.5 | 4000          | 5924.8 | 4850          | 5925.6 |
| 346.3       | 15      | 6640          | 5915.1             |              | 5922.5 | 2880         | 5924.9 | 4000          | 5925.4 | 4850          | 5926.4 |
| 346.4       | 50      | 6690          | 5916.9             |              | 5924.5 | 2880         | 5925.2 | 4000          | 5925.6 | 4850          | 5926.4 |
| 347         | 570     | 7260          | 5929.1             |              | 5933.3 | 2880         | 5933.9 | 4000          | 5934.5 | 4850          | 5935.4 |
| 348         | 380     | 7640          | 5934.5             |              | 5940.5 | 2880         | 5941.1 | 4000          | 5941.9 | 4850          | 5942.3 |
| 349         | 420     | 8060          | 5944.2             |              | 5949.1 | 2880         | 5950.3 | 4000          | 5950.9 | 4850          | 5951.9 |
| 350         | 540     | 8600          | 5954.4             |              | 5959.6 | 2780         | 5960.2 | 3850          | 5960.6 | 4660          | 5961.2 |
| 351         | 570     | 9170          | 5964.0             |              | 5969.4 | 1325         | 5970.0 | 1800          | 5970.4 | 2100          | 5971.9 |
| 352.1       | 610     | 9780          | 5978.2             |              | 5982.2 | 1325         | 5982.9 | 1800          | 5983.3 | 2100          | 5984.2 |
| 352.2       | 35      | 9815          | 5979.0             |              | 5983.1 | 1325         | 5983.9 | 1800          | 5984.3 | 2100          | 5985.4 |
| 352.3       | 30      | 9845          | 5979.0             |              | 5983.6 | 1325         | 5984.3 | 1800          | 5984.7 | 2100          | 5985.8 |
| 352.4       | 25      | 9870          | 5979.5             |              | 5983.5 | 1325         | 5984.2 | 1800          | 5984.6 | 2100          | 5985.5 |



TABLE 1 FLOOD FREQUENCY - ELEVATION AND DISCHARGE DATA  
PROJECT: GROVE CREEK

| X-SEC<br>ID | REACH L | X-SEC STATION | STREAM BTM | 10-YEAR FREQ |      | 50-YEAR FREQ |      | 100-YEAR FREQ |      | 500-YEAR FREQ |      |
|-------------|---------|---------------|------------|--------------|------|--------------|------|---------------|------|---------------|------|
|             |         |               |            | FT           | ELEV | CFS          | ELEV | CFS           | ELEV | CFS           | ELEV |
| 349         | 0       | 8060          | 5944.2     | 5949.1       | 2880 | 5950.3       | 4000 | 5950.9        | 4850 | 5951.9        | 6900 |
| 357         | 320     | 8380          | 5951.6     | 5955.5       | 415  | 5955.6       | 590  | 5956.2        | 775  | 5956.9        | 1200 |
| 358         | 165     | 8545          | 5957.6     | 5960.2       | 415  | 5960.6       | 590  | 5960.9        | 775  | 5961.4        | 1200 |
| 359         | 140     | 8685          | 5959.1     | 5962.4       | 415  | 5962.8       | 590  | 5963.2        | 775  | 5963.8        | 1200 |
| 360.1       | 50      | 8735          | 5960.1     | 5963.1       | 415  | 5963.4       | 590  | 5963.6        | 775  | 5964.1        | 1200 |
| 360.2       | 25      | 8760          | 5960.1     | 5963.2       | 415  | 5963.6       | 590  | 5963.8        | 775  | 5967.0        | 1200 |
| 361         | 47      | 8807          | 5960.6     | 5964.6       | 415  | 5964.9       | 590  | 5966.0        | 775  | 5967.1        | 1200 |
| 362         | 125     | 8932          | 5962.0     | 5965.8       | 415  | 5966.1       | 590  | 5966.5        | 775  | 5967.1        | 1200 |
| 363         | 335     | 9267          | 5965.0     | 5969.6       | 415  | 5970.1       | 590  | 5970.6        | 775  | 5971.3        | 1200 |
| 364.1       | 75      | 9342          | 5967.3     | 5970.5       | 415  | 5971.0       | 590  | 5971.8        | 775  | 5973.3        | 1200 |
| 364.2       | 60      | 9402          | 5971.3     | 5974.3       | 415  | 5975.0       | 590  | 5975.8        | 775  | 5982.0        | 1200 |
| 365         | 60      | 9462          | 5972.0     | 5975.7       | 415  | 5977.0       | 590  | 5978.1        | 775  | 5982.7        | 1200 |
| 367         | 215     | 9677          | 5977.7     | 5981.1       | 415  | 5981.7       | 590  | 5982.2        | 775  | 5983.2        | 1200 |
| 368         | 220     | 9897          | 5981.9     | 5986.6       | 415  | 5987.2       | 590  | 5987.9        | 775  | 5988.5        | 1200 |
| 369         | 320     | 10217         | 5987.3     | 5991.9       | 415  | 5992.4       | 590  | 5993.0        | 775  | 5994.1        | 1200 |
| 370.1       | 80      | 10297         | 5988.7     | 5995.1       | 415  | 5995.3       | 590  | 5996.6        | 775  | 6000.2        | 1200 |
| 370.2       | 30      | 10327         | 5988.7     | 5996.4       | 415  | 5999.8       | 590  | 6000.5        | 775  | 6001.0        | 1200 |
| 371         | 115     | 10442         | 5990.8     | 5997.8       | 415  | 6000.4       | 590  | 6000.8        | 775  | 6001.3        | 1200 |
| 372         | 393     | 10835         | 5997.3     | 6000.5       | 415  | 6001.0       | 590  | 6001.6        | 775  | 6002.7        | 1200 |
| 373         | 200     | 11035         | 6001.3     | 6006.3       | 415  | 6007.1       | 590  | 6007.8        | 775  | 6008.7        | 1200 |
| 374.1       | 220     | 11255         | 6006.3     | 6010.3       | 415  | 6011.1       | 590  | 6011.9        | 775  | 6013.4        | 1200 |
| 374.2       | 50      | 11305         | 6008.3     | 6014.7       | 415  | 6017.4       | 590  | 6017.5        | 775  | 6017.8        | 1200 |
| 374.3       | 20      | 11325         | 6008.3     | 6018.0       | 415  | 6018.2       | 590  | 6018.4        | 775  | 6018.9        | 1200 |
| 374.4       | 50      | 11375         | 6008.5     | 6018.1       | 415  | 6018.3       | 590  | 6018.6        | 775  | 6019.1        | 1200 |
| 375         | 340     | 11715         | 6014.2     | 6018.2       | 415  | 6018.4       | 590  | 6018.7        | 775  | 6019.2        | 1200 |



TABLE 1 FLOOD FREQUENCY - ELEVATION AND DISCHARGE DATA  
PROJECT: BUZZARD CREEK

| X-SEC<br>ID | REACH L | X-SEC STATION | STREAM BTM |        | 10-YEAR FREQ |        | 50-YEAR FREQ |        | 100-YEAR FREQ |        | 500-YEAR FREQ |        |
|-------------|---------|---------------|------------|--------|--------------|--------|--------------|--------|---------------|--------|---------------|--------|
|             |         |               | FT         | ELEV   | FT           | ELEV   | FT           | ELEV   | FT            | ELEV   | FT            | ELEV   |
| 350         | 0       | 8600          |            | 5954.4 |              | 5959.6 | 2780         | 5960.2 | 3850          | 5960.6 | 4660          | 5961.3 |
| 385.1       | 390     | 8990          |            | 5959.4 |              | 5963.2 | 1180         | 5964.4 | 1940          | 5965.0 | 2300          | 5966.0 |
| 385.2       | 35      | 9025          |            | 5960.0 |              | 5964.2 | 1180         | 5965.3 | 1940          | 5965.7 | 2300          | 5966.6 |
| 385.3       | 30      | 9055          |            | 5960.0 |              | 5965.2 | 1180         | 5966.3 | 1940          | 5966.8 | 2300          | 5967.8 |
| 385.4       | 25      | 9080          |            | 5961.9 |              | 5965.7 | 1180         | 5966.9 | 1940          | 5967.4 | 2300          | 5968.5 |
| 386         | 180     | 9260          |            | 5965.4 |              | 5969.0 | 1180         | 5970.2 | 1940          | 5970.7 | 2300          | 5971.6 |
| 387         | 440     | 9700          |            | 5970.7 |              | 5974.5 | 1180         | 5975.1 | 1940          | 5975.5 | 2300          | 5976.8 |
| 388         | 290     | 9990          |            | 5974.1 |              | 5978.4 | 1180         | 5979.3 | 1940          | 5979.6 | 2300          | 5979.8 |
| 389         | 480     | 10470         |            | 5983.6 |              | 5986.8 | 1180         | 5987.6 | 1940          | 5987.9 | 2300          | 5988.4 |



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